CAN INFORMATION NARROW THE GAP BETWEEN STATED AND REVEALED PREFERENCES? THE EFFECT OF INFORMATION ON THE RESIDENTIAL LOCATION PROCESS

by

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SUMMARY

The residential location decision significantly affects household travel patterns based on the options for transportation which are present at various locations. Despite this fact, transportation policies have historically focused on reducing travel demand by affecting decisions like mode choice that are contingent in large part upon residential location. Previous studies have found that providing individuals with information can significantly change the accessibility of the residential locations they choose. In this study I use information about a) individuals' actual residential choices b) their stated preferences for accessibility and c) their revealed choices through a simulation to better understand the how providing individuals with information about transportation attributes of housing options may result in more accessible locations. I conduct three sets of analyses (letter in parenthesis show the sources of information for each analysis). First I compare whether the choices made in the simulation (c) vary by the accessibility of individuals' current housing choices (a). The second analysis combines individuals' stated preferences for housing characteristics (b) with their current housing choices (a) by developing an index of neighborhood dissonance. Using this index, I determine whether providing information to individuals influences location decisions (c) differentially depending on each individual's neighborhood dissonance level. Third, I compare the accessibility characteristics of current housing choices (a) with the choices determined through the simulation (c) to determine whether information yields smaller differences between actual and preferred locations.

The results of the three sets of analysis provide insight into variation in the effect of information on residential location decision-making. In the first analysis, there was no significant effect of accessibility of participants' current residences on their use of information. In the second analysis, there were differential effects of information related to the level of neighborhood type dissonance that participants experienced. In the third analysis, there were significant effects of information on the difference between participants' actual and simulated locations. In particular, and as expected, the effect of information on the accessibility of location decisions is amplified when neighborhood dissonance is medium or high.

In this context, information is seen as a medium to improve the match between stated preferences and actual choices. Previous research had shown that providing information to prospective decision-makers, irrespective of neighborhood dissonance, resulted in location choices that had higher transit service quality and accessibility. However, people with medium and high neighborhood type dissonance between their stated preferences and properties selected in the simulation used information to locate closer to high-quality transit service and their destinations. People with medium neighborhood type dissonance were most likely to use information to locate in more accessible areas. Identifying and providing information to these individuals can significantly affect residential location decisions. The findings have important implications for policymakers and researchers. Providing information to all people is not the most efficient manner to encourage people to locate in more accessible locations. Instead, information should be targeted to people who are living in areas that are moderately different from their preferred environment in terms of accessibility. For researchers, this implies the need to find ways to identify people who are living in areas that do not correspond with their preferences in order to create the greatest change. The findings support the growing evidence that transportation choices can be influenced through targeting information to improve residential location processes.

1. INTRODUCTION

The residential location decision significantly affects household travel patterns based on the options for transportation which are present at various locations. Despite this fact, transportation policies have historically focused on reducing travel demand by affecting decisions like mode choice that are contingent in large part upon residential location. In fact, household location decisions are a primary determinant of local travel patterns, as no amount of information or persuasion will likely influence transit use if the person lives miles from the possible destinations (Rodríguez, Levine, Song and Weinstein, 2005).

One way to increase the pertinence and consideration of transportation options in the residential location decision may be to provide information about transit to consumers during the housing search process. Providing information to consumers can change behavior if that information helps to satisfy preferences for environments with a diversity of transportation options or if the information encourages the consideration of travel mode options previously ignored by travelers.

This study builds on previous research by Rodríguez et al. (2005) examining the role that providing more information plays in residential location choices. The previous study asked participants (graduate students at the University of Michigan) to choose their most desired residential locations from a set of actual properties in Ann Arbor, Michigan. Participants were divided randomly into two groups. All participants were asked to choose five properties after examining the properties using a search tool that had property attributes such as rent and number of bedrooms. The experimental or treatment group received information about transit and transportation in addition to other property information while the control group did not. Results

of this simulation showed that location choices varied significantly between the two groups. The treatment group chose properties that were on average 0.24 miles or 40% closer to high-quality transit to participants' primary campus and 0.3 miles or 30% closer to major destinations than the control group. Although the study's findings have important practical implications, the analysis did not include information about participants' revealed preferences implicit in their current housing choices. This information can reveal whether existing residents of neighborhoods with certain degree of accessibility are more or less pervious to the information treatment provided by the experiment relative to residents of areas with different accessibility levels.

A growing body of research examines and attempts to explain the divergence between stated preferences (expressed in theory) and revealed preferences (expressed in reality). The gap between preferences exists in many decisions where the preferences that people state are not reflected in their actual choices. For residential location decisions, this divergence has been termed "neighborhood type dissonance" by Schwanen and Mokhtarian (2004). In this study the term residential neighborhood type dissonance will be used in the same manner as suggested by Schwanen and Mohktarian, to denote incongruence in terms of land use patterns and other attributes between the neighborhood type where an individual is currently residing and the individual's preference structure regarding such characteristics of the residential environment. Providing transportation information to housing seekers may be one way to narrow the gap between stated and revealed preferences.

In this analysis I incorporate information contained in participants' actual residential choices to better understand the causal pathways through which the information treatment resulted in more

accessible locations. First I use the actual residential location of study participants to determine whether information differentially affects revealed choices for participants having various levels of accessibility. Second, and building on the work of Schwanen and Mokhtarian (2004, 2005), I examine how the information affects participants with varying levels of neighborhood type dissonance by comparing stated preferences and preferences revealed through actual and simulation choices. Finally, I replicate previous work to illustrate the significant differences between properties chosen based on whether or not participants were provided with information in the search process.

2. LITERATURE REVIEW

There have been a number of studies regarding the household location decision-making process and neighborhood type dissonance. In general, they focus on the nature of housing and residential location decisions, aspects that are considered in the residential location decision, and the imperfect nature of the residential location choice process. The nature of this decision process has been examined in detail by Schwanen and Mohktarian, who state that "at least three types of factors explain the existence of residential neighborhood type dissonance: those relating to *residential preferences*; those that are associated with the *residential choice process*; and those that have to do with *dynamics in the life course and attitudes"* (2004*).* This study seeks to determine how to reduce dissonance caused by imperfections in the residential choice process. However, the nature and complexity of this decision process tend to make this decision one in which people's stated and revealed preferences cannot be perfectly aligned.

A desirable area is one that affords a relatively close fit between the preferences of its residents on the one hand, and their actual choices on the other (Levine and Inam, 2004). The term "neighborhood type dissonance" is used to describe the lack of congruence between the built environment neighborhood and residents' stated preferences for environments (Schwanen and Mokhtarian, 2005). Individuals with low dissonance have a close fit between their stated preferences and their choices. One study noted that the difference between citizens' stated preferences and actual behavior (Baldassare, Ryan, and Katz, 1997) is a hindrance to developing environments which align most closely with real preferences. This is an issue because sometimes people state preferences which they may perceive as "the right choice" rather than expressing their true feelings. This is common criticism of any method that measures stated preferences using hypothetical questions and then makes conclusions about people's choices (Mitchell and Carson, 1989). Despite criticism about describing stated preferences, many recent studies have addressed the gap between stated and revealed preferences for residential location.

The nature of the residential location decision process is different that many other decisions because of the nature and expense of housing. Housing is extremely heterogeneous, very durable, and immobile in space (Porell, 1982). The residential location decision is the largest investment decision many people make (Kim, Pagliara, and Preston, 2005) and is extremely complex (Jarvis, 2003). Some studies of the residential choice process have used a discrete choice framework to describe how households make this decision. This framework assumes that a household chooses one dwelling from a large set of discrete and heterogeneous alternatives where all the aspects of the chosen dwelling generate the highest utility (Earnhart, 2002). If the household choice decision is considered this way, then households may choose locations that do

not meet some of their preferences if a location very closely meets others. The final location that households choose ends up representing a tradeoff between many attributes (Kim et al., 2005). This means that people end up "satisficing" (Simon, 1957) and may sacrifice transportation options such as living near a bus route or in an area that is walkable for other attributes of residential locations or vice versa. As Brower notes, "there are few residences with one door on Fifth Avenue, another on a New England Common, and a window looking out over the mountains" (qtd. in Schwanen and Mokhtarian, 2004). Housing preferences may differ between individuals within the same household (Molin et al., 1999), further complicating the decision-making process and making complete satisfaction of all members unlikely.

A major consequence of satisficing in the residential location process is that residential locations may not satisfy people's desires for transportation because other factors were given greater consideration in decision-making (Schwanen and Mokhtarian, 2004). Transportation is often given lower consideration in residential location decision-making than other aspects of either neighborhoods or the dwelling unit itself. Though households may consider the distance to work when choosing where to live, it is not apparent that many consider the variety of options for transportation other than the automobile. In a most general sense, location decisions are based on a tradeoff between transportation costs and housing costs (Alonso, 1964). However, the fact that many households choose to locate in areas that are accessible only by automobile indicates that variety of modes available is not considered. Part of the reason that transportation is not a top consideration is the variety of aspects of each dwelling. Housing is a "multidimensional bundle of attributes of the dwelling and its locational environment" (Porell, 1982, 4) and accessibility is the primary transport-related variable. Other factors such as schools (Jarvis, 2003), housing

status and dwelling quality (Kim et al., 2005) and safety (Levine, Inam and Torng, 2005) have been shown to be more salient transportation or accessibility. In essence, people assume that they will use automobiles for daily travel and consider this cost to be virtually independent of residential location, rather than considering locations where housing may be more expensive yet transportation less expensive.

The residential search process itself can reduce the ability of people to locate in their most desired locations through limitations of time and information. It is virtually impossible for a person to examine every available property. This means that people often limit their search to some small percentage of actual available properties. This is another example of satisficing behavior that can lead people to choose properties that are do not reflect all their preferences simply because they may not have considered all the options. Limited property information may also result in a discrepancy between revealed and stated preferences if a person is unable to acquire the information they want easily. For example, a person might choose their location without considering transit lines if such information is not readily and easily available. Though some people might seek this information out specifically, others will simply make a choice without all the information needed to allow them to make a choice which most closely matches their ideal residential location.

Other dynamics of the residential location choice process that explain why a person's stated and revealed preferences may differ include the limited options available at a given time and dynamics of the search process. Occupancy of desired residences is limited, and only those residences that are vacant at the time of decision-making are available for a person to choose.

This means that a person may end up choosing a residence which is less than their ideal choice simply because the location they desire is not available. In addition, the processes by which actual and stated preference decisions are made vary. In a 2002 study, Earnhart found that "actual and hypothetical housing selections are guided by similar decision processes with respect to only certain parameters, such as the number of bedrooms per person, yet dissimilar processes with respect to other parameters, such as lot size (acres per person)" (167). This means that while a person may state a certain preference when asked about residents they desire, that same person may not actually seek out properties with all the attributes that they may prefer.

Beyond the search process, it is important to note that the urban form of cities may also create gaps between stated and revealed preferences. Many urban planners argue that current residential environments do not offer a variety of housing situations to satisfy the preferences of the population. Schwanen and Mohktarian synthesized the conclusions of several studies (Brower, 1996, Amerigo, 2000, Talen, 2001) to indicate that residential environment includes three distinct dimensions: the *dwelling*; the *physical structure* of the neighborhood, including the nature, mix, and intensity of land uses; and the *neighbors* who represent the social dimension. Talen found that while suburban residents of Dallas were not satisfied with physical aspects of their environment, they did not support traditional urban design features that provide an alternative to typical suburban environments. Since congruence between residential environment and opinions about the ideal environment is one of the elements of residential satisfaction (Amerigo, 2000), the fact that residents are not satisfied with their built environments suggests that some gap exists between people's preferences and the living environments available in many

cities. Our analysis focuses on the physical structure of the residential environment and the dissonance regarding those physical attributes.

Considering existing location choices as a true reflection of consumer preferences ignores irregularities such as the narrow range of options in the market (Yago, 1983). The market has failed to provide the type of development which appeals to people who prefer transit- and pedestrian-friendly environments (Levine, Inam, and Torng, 2005). Another support for the argument that some types of neighborhoods are undersupplied is the higher residential prices commanded by many New Urbanist and neo-traditional developments (Eppli and Tu, 2000; Song and Knapp, 2003). About a quarter of households in recent studies of the San Fransisco Bay and Portland areas lived in neighborhoods that didn't match up with stated land use preferences (Schwanen and Mokhtarian, 2004, 2005). One reason for this mismatch was orientation of neighborhoods towards automobile travel, and some suburban residents also expressed a preference for higher densities. This figure confirms previous findings that about one quarter of people in the Denver area did not identify with the neighborhoods they lived in (Feldman, 1990). Feldman further found that households experiencing a mismatch that were planning to move were looking in areas that would more closely match their preferences. Another factor that must be accounted for is that some individuals experiencing high neighborhood type dissonance adjust their preferences to reflect their current residences rather than moving, effectively reducing dissonance (Festinger, 1957). These residents would appear to have low neighborhood type dissonance based on stated preferences.

The existing literature describing residential choice processes indicates that gaps between stated and revealed preferences exist for a variety of reasons. There are several theoretical reasons to expect that information will affect residential choices and that information is a salient factor that affects this gap. Providing more information can reduce the amount of satisificing that occurs because of imperfect information and increase the consideration of transportation when tradeoffs between preferences occur. These factors indicate that it is important to identify ways that information can allow for better choices and reduce the gap between stated and revealed preferences.

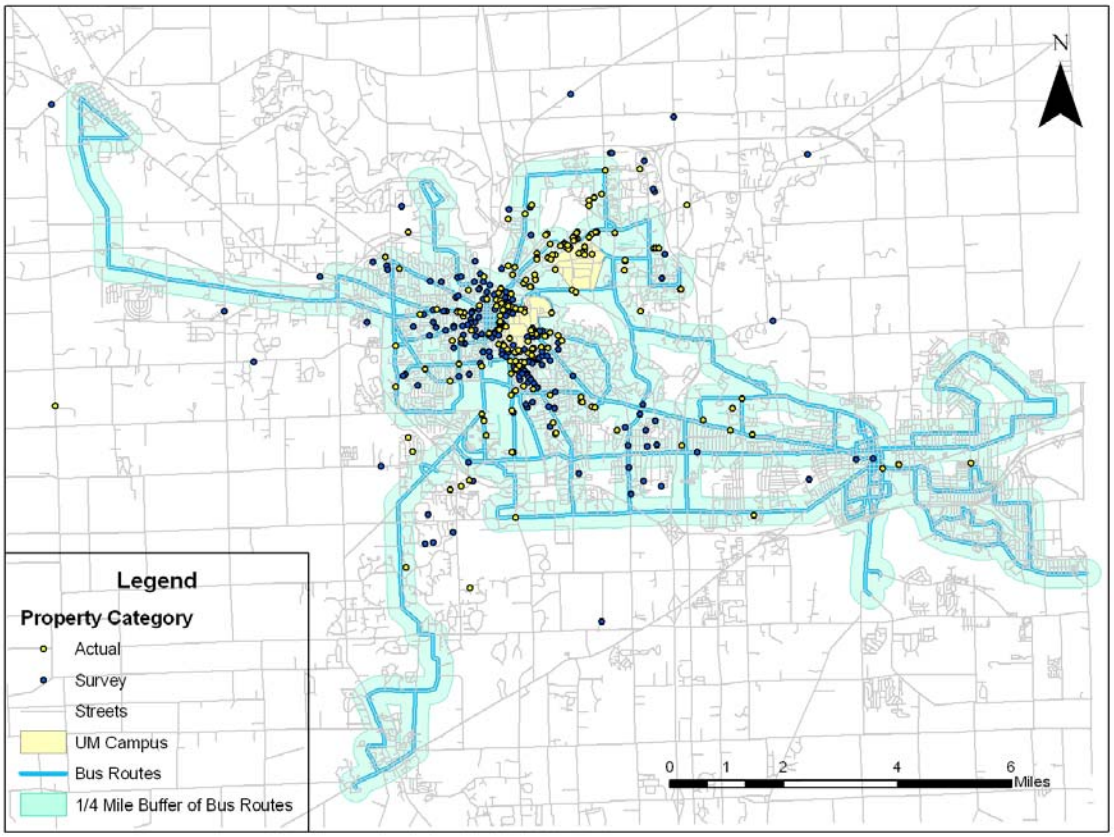
3. METHODOLOGY

My analysis of stated and revealed preferences for residential location will seek to test several relationships. The first relationship tested is the relationship between accessibility at participants' current residence and use of information. The second relationship tested is the relationship between participants' level of dissonance between their stated preference for accessibility and the accessibility at the locations they chose in the experiment and use of information. The third relationship tested is the relationship between participants' level of dissonance between their stated preference and the accessibility at their actual residences and use of information. The final analysis replicates previous findings and show that participants who received information about transportation chose properties that were statistically different than those chosen by participants who did not receive information.

The data studied was gathered in Ann Arbor, Michigan at the University of Michigan. The experiment brought 236 graduate students into a computer lab, where they were asked to select

their top five choices out of a database of residential properties. Properties in the database were actual properties chosen from the University of Michigan off-campus housing database. In order to test whether transportation information can affect residential location choices, participants were divided into control and experimental groups. The experimental group received the same information about properties (price, bedrooms, parking, etc) as the control group, but also received information about how far the unit was from a transit stop, the transit service and directness, and distance to the part of the university that the student visits most often. Upon choosing all five properties, respondents were asked about demographic characteristics, including their existing residential location. Participants were asked to rate the importance of characteristics in their decision, including proximity to destinations and other factors. (For complete details of the experiment, see Rodríguez, Levine, Song and Weinstein, 2005). Figure 1 shows the actual and selected locations of participants in the survey.

Figure 1. Selected and Actual Residential Locations



Stated preference data was gathered from survey questions which asked participants about the importance of various factors in their location decision, including accessibility to destinations and proximity to transit. Two sources of revealed preference data were available from the study: simulation properties chosen and current actual residential location based on addresses given by participants. The attributes of the revealed preferences through simulation property data from participants' choices in the experiment were calculated as an average of attributes of the top five properties chosen from the database. This average was used to ensure that the attributes captured were representative of the respondents' preferences, rather than simply an outlier or atypical property. In addition, considering the top five properties allowed for more robust data, as opposed to considering a single one. The attributes of the revealed preferences through actual property data were calculated using either the exact address or the street and nearest cross-street.

The second type of revealed preference data was calculated based on the attributes of the actual residential location of the participants. The experiment asked participants for the address of or closest intersection to their actual residence. This data was geocoded using Geographic Information Systems to create a point layer which could be analyzed and compared to points of data representing the properties selected in the study. Of the 236 respondents, five provided address information which could not be geocoded. Two provided addresses which could only be located at the ZIP code level; two provided only a single street name of a lengthy street, and could not be accurately placed; and one provided an address outside the study area, in suburban Detroit. These five respondents were representative of the sample in gender, age, and race. They were not representative of the sample in terms of income, as they had a lower average income than the sample. In addition, one respondent was from the control group and four were from the

experimental group, which is not reflective of the sample as a whole. However, the very small number of respondents whose data was not geocoded means that the overall affect on the analysis is negligible. The information for these respondents was removed from the data, leaving a total of 231 participants with complete data for all questions, actual residential location, and simulation residential location choices.

Stated preference data was quantified by examining the importance participants assigned to several characteristics of residences, including size of the housing unit, on-site parking, and proximity to campus and work, and the presence of shops and services nearby. Participants ranked the importance of these factors when considering a residence in the Ann Arbor area with a score from 1 to 4, with 1 being unimportant and 4 being very important. Size of housing unit and presence of on-site parking were assumed to be related to low accessibility due to the fact that larger housing units and parking lots are more likely to be located in suburban areas. Table 1 displays the accessibility scores. To determine overall preference for accessibility, scores for all five variables were combined in to an index. Scores of 0-2 indicated low stated preference, scores of 3-5 indicated a medium preference, and scores of 6-10 indicated a high preference.

Table 1. Stated Preference Data from Survey Questions

Variable	Accessibility Preference		
	Low	Medium	High
Size of Housing Unit	4	3	1-2
On-site Parking	4	3	1-2
Proximity to Campus	1-2	3	4
Proximity to Work	1-2	3	4
Presence of Shops and Services nearby	1-2	3	4

Revealed preferences for accessibility were quantified using a condensed version of accessibility ratings that were presented to participants in the simulation (Rodriguez et al., 2005). For this study, excellent and high accessibility were condensed into one category to ensure that each

category would have enough properties to allow for statistical analysis. Table 2 shows the definitions of the accessibility categories used to divide properties into high, medium, and low accessibility.

Table 2. Accessibility Categories for Properties

Level of Accessibility	Description
High	Walking distance to bus route with zero transfers to campus and greater than 15 minute frequency
Medium	Walking distance to a bus route with 1 transfer to campus, regardless of frequency
Low	None of the above

Participants' neighborhood type dissonance was measured by comparing the stated preference for accessibility to the revealed preferences from the simulation properties chosen and the actual residential locations. Neighborhood type dissonance was considered to be high if a participant stated a preference for high accessibility and revealed a preference for low accessibility, or if a participant stated a preference for low accessibility and revealed a preference for high accessibility. Neighborhood type dissonance was considered to be low if stated and revealed preferences were for the same accessibility, low, medium, or high. Table 3 displays the preferences considered for each neighborhood type.

Table 3. Neighborhood Type Dissonance Categories

Neighborhood Type Dissonance Level	Stated Preference	Revealed Preference
High	Low	High
	High	Low
Medium	Low	Medium
	Medium	Low
	Medium	High
	High	Medium
Low	Low	Low
	Medium	Medium
	High	High

To compare the effects of information on participants with varying accessibility and neighborhood type dissonance, a number of variables were calculated for the residential

locations in the simulation and actual locations. Several variables were those specific to a residential location, network distance to “high-quality” transit to participants’ primary (most-visited) University of Michigan campus; frequency of transit within ¼ mile in buses per hour; distance to closest destination; and total distance to main destinations. Four main destinations included: the three University of Michigan campuses and downtown Ann Arbor. One variable, population density, was specific to neighborhood and surroundings rather than a specific site. Population density was calculated at the Census block group level.

Comparisons of the attribute values of the chosen properties and actual residential locations were performed to identify any variables in which participants in different accessibility and neighborhood type dissonance conditions chose properties that differed significantly. Analysis of variance (ANOVA) was used to test for statistical significance of the variance between properties chosen by various groups of participants. Analysis of variance was performed for properties chosen by participants with different current accessibility and different neighborhood type dissonance levels. To replicate previous findings, analysis of variance between actual and simulation preferences for the entire population of participants, between actual and simulation preferences for the control and experimental groups, and between actual and simulation preferences for experimental group members based on current travel habits and demographic information.

To summarize, I conduct three types of comparisons. The first analysis compares the choices individuals made with the simulation with the levels of accessibility of individuals' current housing choices. The second analysis, in two parts, compares individuals' stated preferences for

accessibility to their current housing choices by developing an index of neighborhood dissonance and compares stated preferences to housing choices in the simulation. The third analysis compares the accessibility of current housing choices with the choices determined through the simulation to determine whether information yields smaller differences between actual and preferred locations.

4. FINDINGS

This section summarizes the findings related to how providing transportation information affects the gap between stated and revealed preferences. The effects of information were examined for participants who lived in areas of varying accessibility. These results are included in section 4.1. The effects of information were also tested for participants who were experiencing varying levels of neighborhood type dissonance. These results are included in section 4.2. The effects were also examined the effect of information on differences between participants' actual residential locations and simulation choices. These results are included in section 4.3.

4.1 ACCESSIBILITY RESULTS

The accessibility of participants' current residences was one variable that could affect how participants chose properties and used information provided in the search process. My hypothesis was that participants who lived in areas with low accessibility would pick properties that differed from those chosen by participants who lived in areas with medium or high accessibility. The findings show, however, that there was no statistically significant difference between properties chosen by experimental group members living in areas of low accessibility and experimental group members living in areas of medium or high accessibility.

4.2 NEIGHBORHOOD TYPE DISSONANCE RESULTS

4.2.1 Stated Preferences vs. Simulation Properties

The level of dissonance between participants' stated preferences for accessibility and participants' revealed preferences for accessibility was another variable that could affect how participants chose properties and used information in the search process. My hypothesis was that participants with higher dissonance would use information to locate in areas that were more accessible to achieve greater consonance between their stated preferences and revealed preferences.

Table 4 displays the differences between properties chosen by participants in the control and experimental groups depending on their level of neighborhood type dissonance. Figures 2 through 6 display the same information in graph format. Of participants with low dissonance, experimental group members chose properties that were located in areas with lower population density than their control group peers. Of participants with medium dissonance, experimental group members chose properties that were located an average of 0.28 miles closer to high-quality transit, 0.32 miles closer to their nearest destination, and 1.23 miles closer in total distance to all destinations than their control group peers. These findings indicate that participants with medium dissonance are most likely to use information to locate in areas with better accessibility. Of participants with high dissonance, experimental group members chose properties that were located 0.3 miles closer to high-quality transit and in areas that had higher population density than their control group peers.

Table 4. Analysis of Variance, Stated Preference-Simulation Preference Gap

	Low Dissonance			Medium Dissonance			High Dissonance		
Variable	Control Mean	Exp. Mean	p-value	Control Mean	Exp. Mean	p-value	Control Mean	Exp. Mean	p-value
n	41	26		56	69		19	20	
Total Buses	8.79	8.96	0.913	10.52	11.31	0.561	12.11	14.19	0.267
Distance to High-Quality Transit	0.88	0.67	0.215	0.88	0.60	0.016**	0.66	0.36	0.064*
Distance to Nearest Destination	1.44	1.12	0.183	1.39	1.07	0.043**	0.94	0.69	0.242
Sum of Distance to Major Destinations	8.49	7.31	0.217	8.38	7.12	0.063*	6.56	5.58	0.281
Population Density	10683	8545	0.069*	8991	10067	0.306	6966	12328	0.000***

Note: ***, **, and * are significant at 99%, 95%, and 90% levels, respectively

These findings indicate that the effect of information is somewhat dependent on participants' level of dissonance. Information had the largest effect on participants experiencing medium levels of dissonance. These participants located closer to transit, their nearest destination, and all destinations. Participants with medium dissonance who received information chose properties that could reflect a closer match between stated and revealed preferences. These participants may be people who would not seek out transportation information on their own, but will use it if it is readily available. Participants with low dissonance chose similar locations in all characteristics except for population density, regardless of whether or not they received information about transit. This may be because accessibility is a more salient concern for participants who are living in areas that do not match their preferences, thus those participants are more likely to alter their decision-making when presented with additional information. Participants with high dissonance chose locations that were located closer to high-quality transit and in areas with higher population density.

Figure 2. Relationship between Dissonance Level and Total Buses (95% CI)

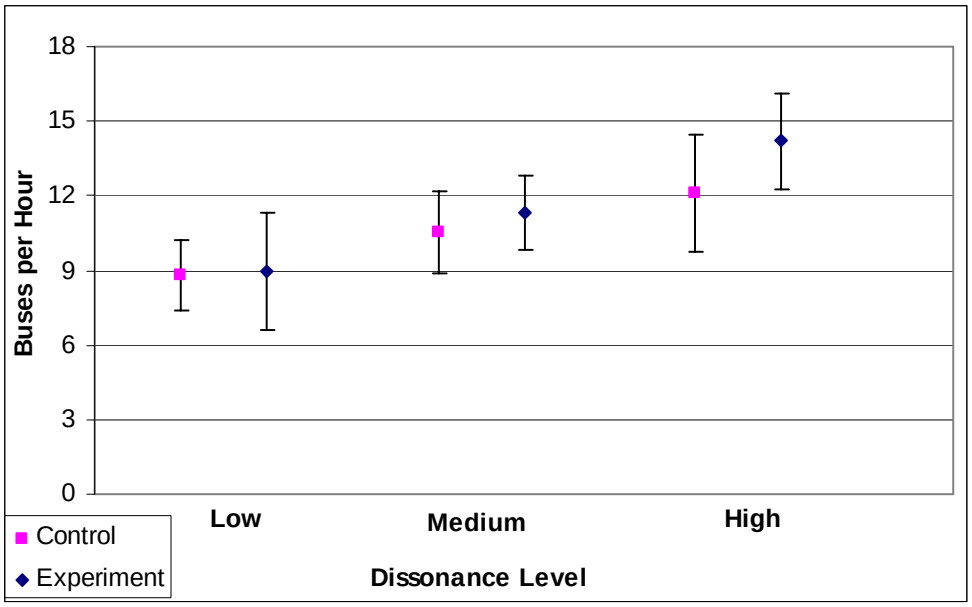


Figure 3. Relationship between Dissonance Level and Distance to High-Quality Transit (95% CI)

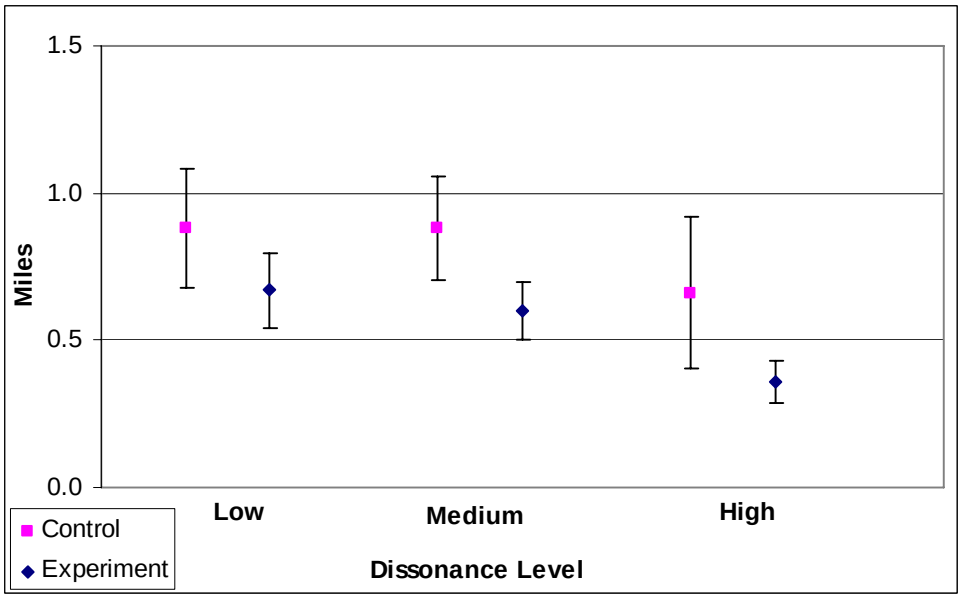


Figure 4. Relationship between Dissonance Level and Distance to Nearest Destination (95% CI)

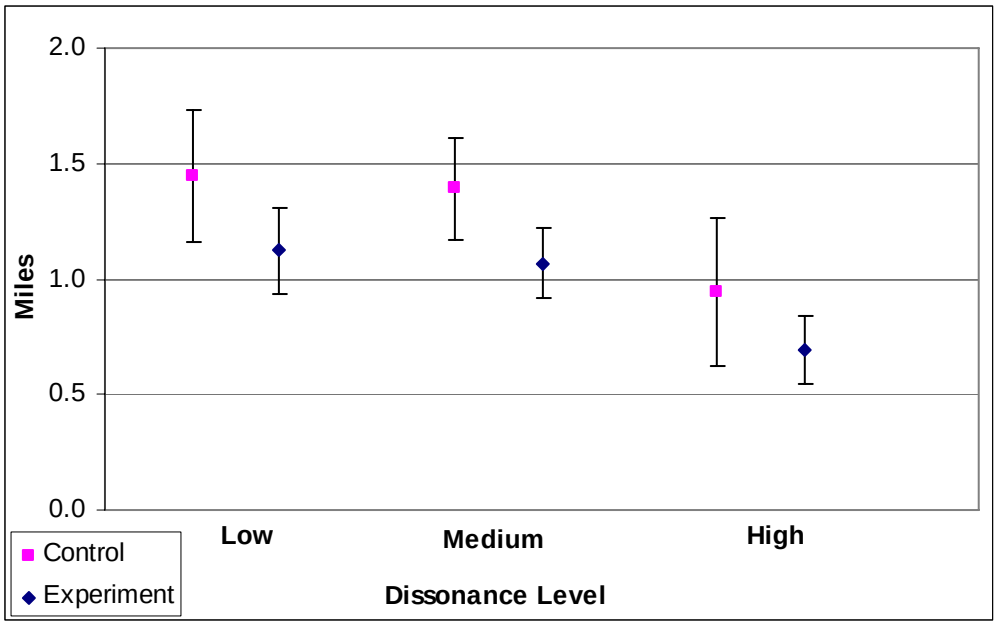


Figure 5. Relationship between Dissonance Level and Total Distance to all Destinations (95% CI)

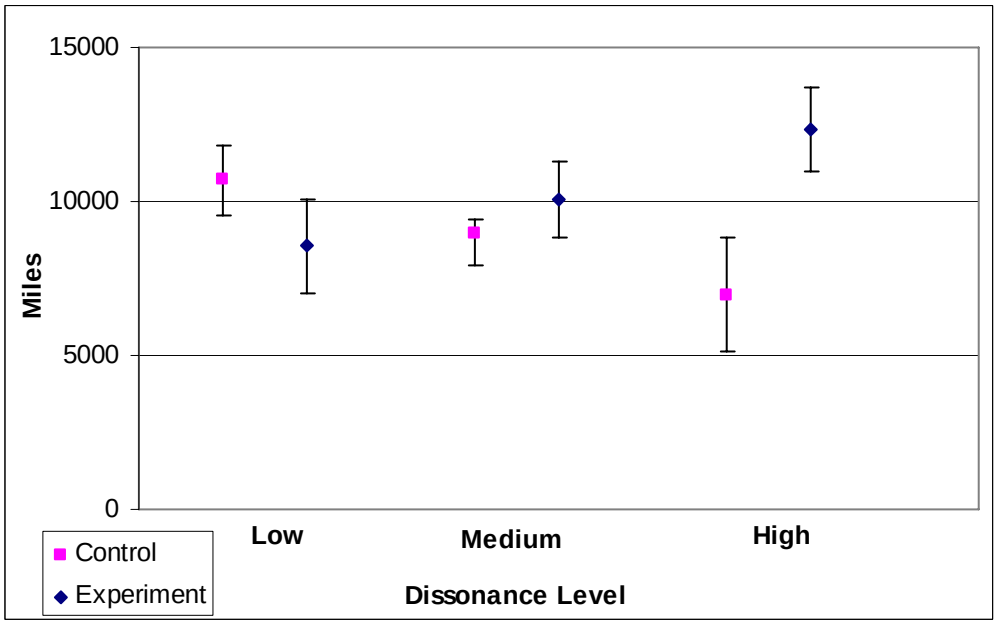
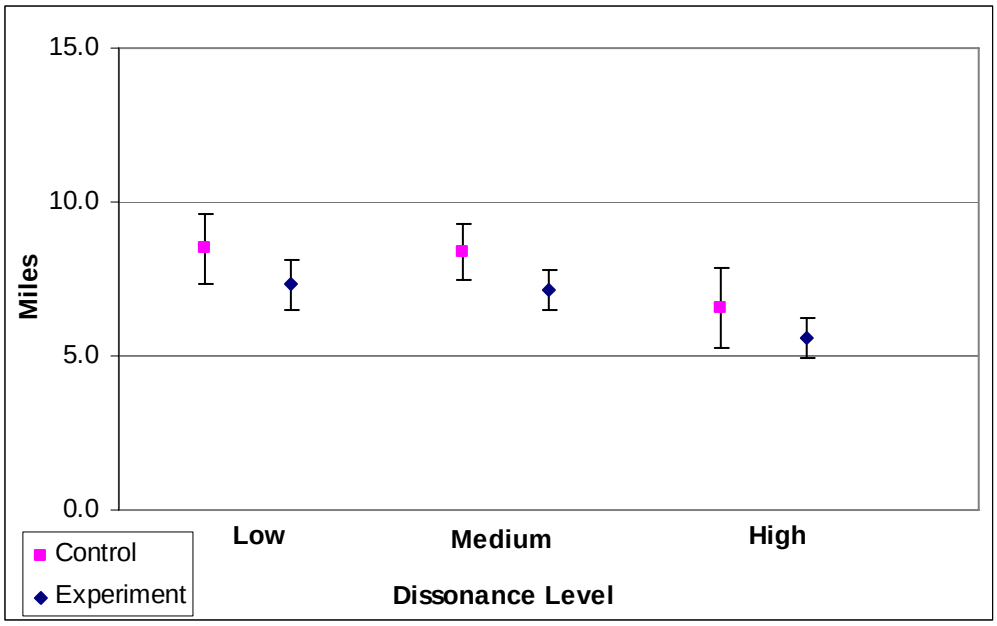


Figure 6. Relationship between Dissonance Level and Population Density (95% CI)



4.2.2 Stated Preferences vs. Actual Residential Locations

Though actual residential locations represent revealed preferences also, the use of information by participants with dissonance between stated preferences and actual locations was different that that of participants with dissonance between stated preferences and simulation locations.

Table 5 displays the coefficients reflecting the difference in properties chosen by control and experimental group members based on their level of dissonance. Figures 7 through 11 display the same information in graph format. Of participants with low dissonance, experimental group members chose properties that were not significantly different from control group members. Of participants with medium dissonance, experimental group members chose properties that were 0.14 miles closer to high-quality transit and 0.10 miles closer to their nearest destination than their control group peers. Of participants with high dissonance, experimental group members chose properties with a total distance to all destinations 1.51 miles less than their control group peers.

Table 5. Analysis of Variance between Control and Experimental Groups
Stated Preference-Actual Location Gap

	Low Dissonance			Medium Dissonance			High Dissonance		
Variable	Control Mean	Exp. Mean	p-value	Control Mean	Exp. Mean	p-value	Control Mean	Exp. Mean	p-value
n	57	77		51	31		8	7	
Total Buses	12.81	13.41	0.63	7.61	7.36	0.83	7.63	5.24	0.61
Distance to High-Quality Transit	0.53	0.43	0.16	0.99	0.75	0.08*	2.18	1.33	0.16
Distance to Nearest Destination	0.89	0.80	0.61	1.65	1.33	0.10*	2.53	2.01	0.44
Sum of Distance to Major Destinations	6.23	5.94	0.40	9.48	8.24	0.13	12.96	11.45	0.01***
Population Density	10835	11526	0.471	7873	7609	0.787	6843	5705	0.696

Note: ***, **, and * are significant at 99%, 95%, and 90% levels, respectively

These findings correspond with the other analysis results that the effect of information is somewhat dependent on participants' level of dissonance. These findings indicate that transportation information affects people with different levels of dissonance in different ways. Information resulted in people with medium dissonance choosing to locate closer to high-quality transit and closer to their nearest destination. This indicates that information allows people with medium levels of dissonance to locate in areas that may better meet their accessibility preferences. The evidence that participants in this group locating 24% closer to transit and 20% closer to the nearest destination shows that information may increase the consideration of accessibility in the decision-process. For people with high dissonance, transportation information resulted in choices of properties that were closer on average to major destinations. However, the fact that these participants chose properties that were still an average of 11.45 miles from their destinations indicates that they may not be much more accessible by non-automobile travel.

Information primarily affected participants with medium neighborhood type dissonance rather than participants with low or high dissonance. .The fact that level of dissonance between actual locations and stated preferences had very little effect on simulation property choices for people

with low dissonance may reflect the fact that participants who are satisfied with their current location are unlikely to use information to make different decisions. Additionally, people with high dissonance also appear to be unlikely to use information except with regard to locating in more dense areas. Participants with high dissonance may have constraints on their decision-making that preclude locating in more accessible areas, such as a need to locate near a family member's job or school. The evidence shows that people with medium neighborhood type dissonance are more pervious to information in their residential search process.

Figure 7. Relationship between Dissonance Level and Total Buses (95% CI)

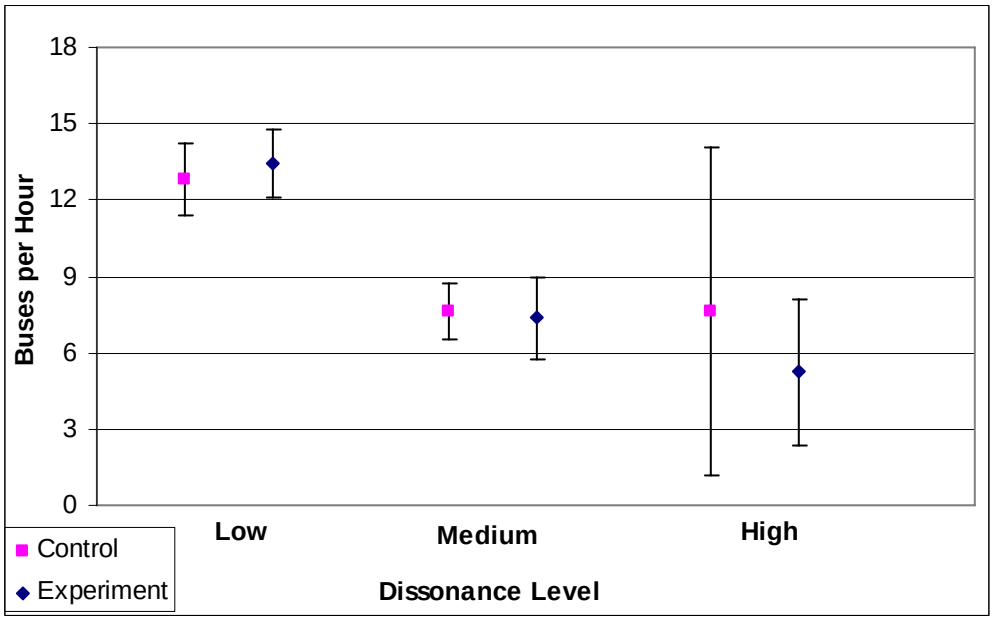


Figure 8. Relationship between Dissonance Level and Distance to High-Quality Transit (95% CI)

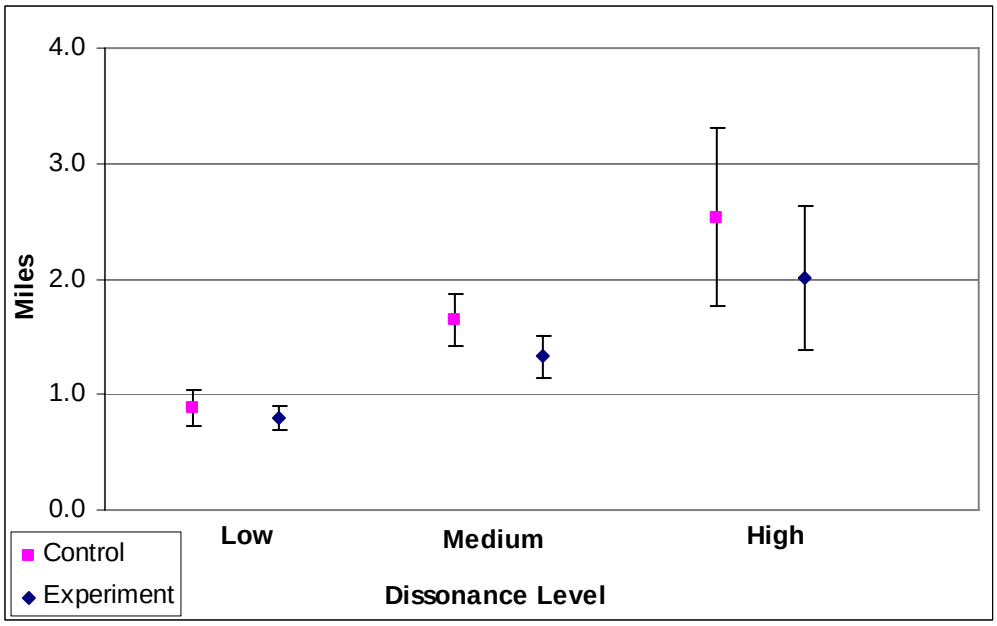


Figure 9. Relationship between Dissonance Level and Distance to Nearest Destination (95% CI)

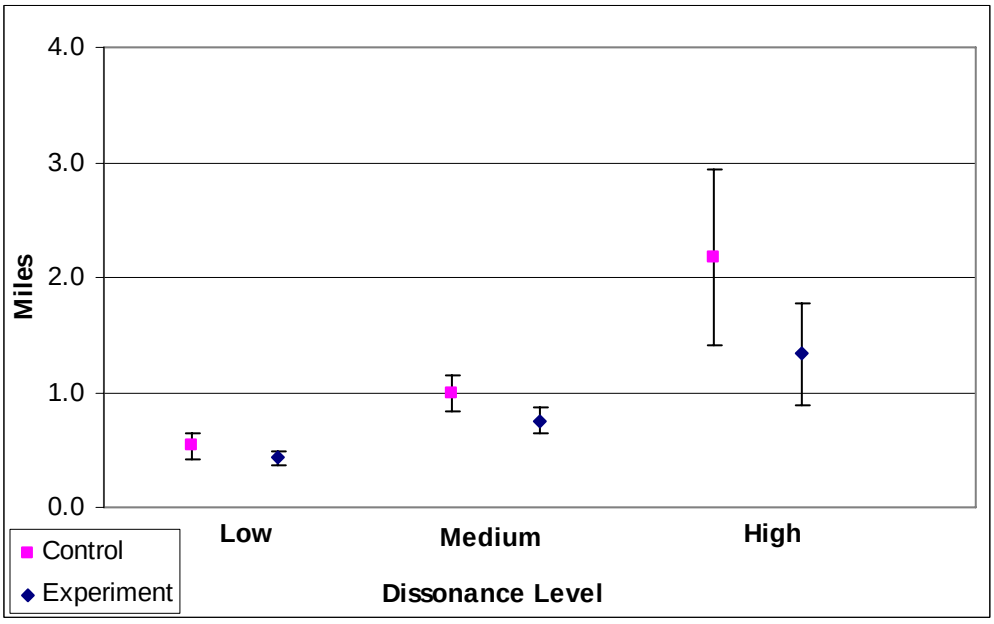


Figure 10. Relationship between Dissonance Level and Total Distance to Destinations (95% CI)

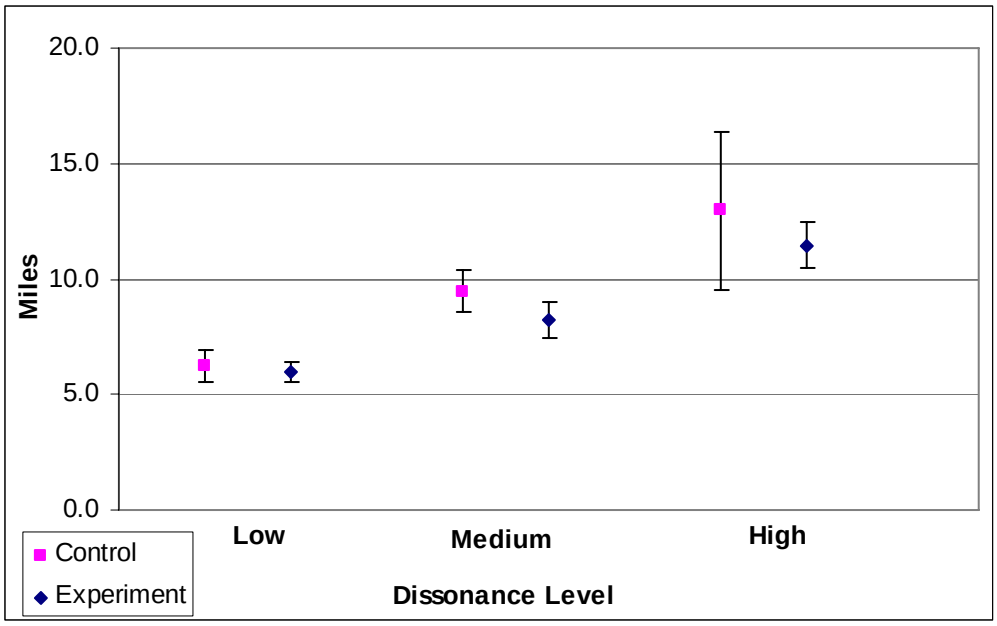
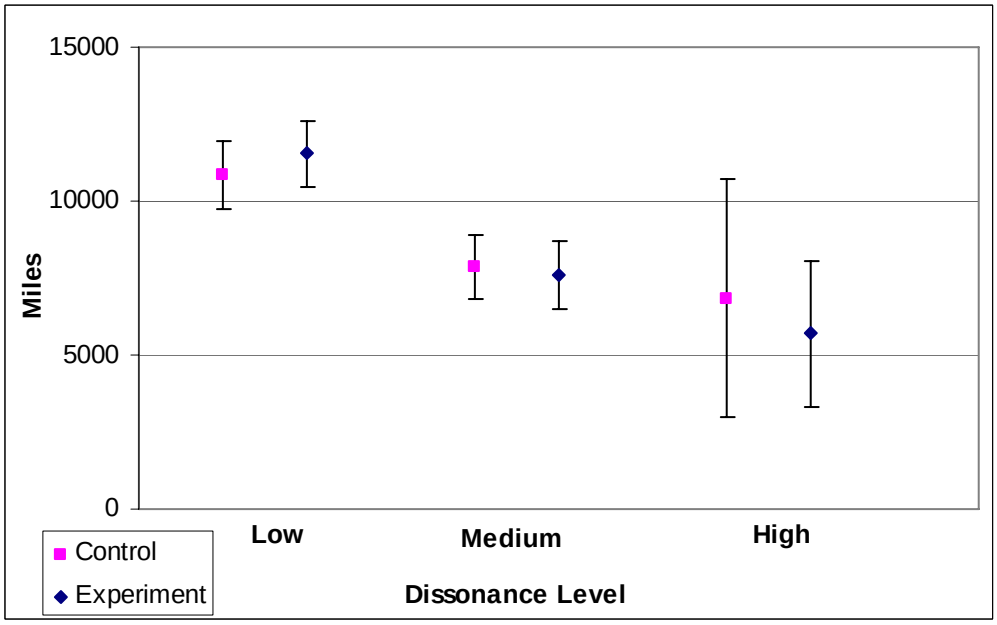


Figure 11. Relationship between Dissonance Level and Population Density (95% CI)



4.3. INFORMATION EFFECTS

The data was also used to compare the actual properties of participants with the properties they chose in the experiment and examine the differences between these two types of revealed preferences. The divergence between selected and actual properties is referred to as a location

choice gap because it represents a difference between locations chosen in two situations, on real and one simulated. Table 6 contains the summary statistics for selected and actual properties of participants in the study. Simulation properties included were selected by at least one participant.

Table 6. Descriptive Statistics for Selected and Actual Properties

Variable	Units	Selected Simulation Properties					Actual Properties				
		n	Mean	Std Dev	Min	Max	n	Mean	Std Dev	Min	Max
Frequency of Service	Buses per hour within 1/4 mile	224	9.78	0.72	0	42	231	11.16	0.68	0	40
Distance to High-Quality Transit	Miles	224	0.71	0.96	0.02	9.40	231	0.44	0.88	0.02	9.00
Distance to Nearest Destination	Miles	224	1.17	0.06	0.16	10.68	231	1.38	1.48	0.16	9.10
Sum of Distance to Major Destinations	Miles	224	7.49	0.24	2.92	46.27	231	8.91	5.72	3.53	38.20
Population Density	Persons per Square Mile	224	9280	668	170	55050	231	7927	582	215	55051

4.3.1 Selected and Actual Properties

The properties selected by participants reflect one type of revealed preferences for residential location. Table 7 shows the mean values for variables for properties selected in the study and for properties where participants lived in reality. The simulation values reflect the average of the top five properties selected by participants, thus the mean values for simulation properties chosen differ from Table 6. Participants selected properties that were farther from high-quality transit and but closer all of the major destinations than their actual properties. Despite the fact that participants chose properties that were further from high-quality transit, they still chose locations with high levels of transit service, as reflected in the number of buses per hour within ¼ mile. Participants selected properties in areas with higher population density than the area of their actual properties.

Table 7. Analysis of variance between Simulation and Actual Properties

Variable	Simulation	Actual	
	Mean	Mean	p-value
Total Buses	10.72	11.16	0.598
Distance to High-Quality Transit	0.71	0.44	0.000***
Distance to Nearest Destination	1.18	1.38	0.078*
Sum of Distance to Major Destinations	7.51	8.91	0.002***
Population Density	9685	7927	0.010***

Note: ***, **, and * are significant at 99%, 95%, and 90% levels, respectively

This evidence suggests that some attributes of participants' existing locations did not correspond with their preferences. This is expected given the existing literature regarding the tradeoffs made in the residential decision-making process. Participants would prefer locations which are well-served by transit service, with an average of 10.72 buses per hour within a short distance. Participants would prefer locations which are further from high-quality transit. However, locations which were on average only 0.71 miles from high-quality transit are still within walking distance. In addition participants would prefer locations which are closer to their nearest destination and closer to all destinations than their actual locations.

4.3.2 Control and Experimental Groups

To determine whether transportation information affects the location choice gap, the difference between selected and actual properties was calculated for the control and experimental groups. Table 8 shows the results of this analysis. Though participants' choices reflected gaps between their actual locations and the properties chosen in the experiment, the control and experimental group results must be compared to examine the effects of providing information about transportation to housing seekers.

Table 8. Analysis of variance between Control and Experimental Groups

Variable	Control	Experimental	
	Mean Difference	Mean Difference	p-value
Total Buses	0.54	0.33	0.87
Distance to High-Quality Transit	0.55	-0.02	0.04**
Distance to Nearest Destination	0.16	-0.56	0.04**
Sum of Distance to Major Destinations	-0.18	-2.63	0.06*
Population Density	-1518	-2001	0.68

Note: ***, **, * and are significant at 99%, 95%, and 90% levels, respectively

The difference between the actual and simulation locations chosen for the control and experimental groups was significant for network distance to high-quality transit and distance to nearest destination. Experimental group participants chose properties that were an average of 0.02 miles closer to high-quality transit, 0.56 miles closer to the nearest destination, and 2.63 miles further from all destinations than their actual properties. Control group members selected properties that were an average of 0.55 miles further from high-quality transit, 0.16 miles further from the closest destination, and 0.18 miles closer to all destinations than their actual properties.

This evidence suggests that transportation information results in a smaller location choice gap for distance to high-quality transit. Previous evidence showed that information makes people locate closer to high-quality transit to their major destinations. When not provided with transportation information, participants are likely to base their decisions more on other attributes of properties such as price and size, leading to a greater gap between preferences for locations near transit because this is not the focus of the search. Thus, transportation information allows participants to find properties which more closely match their preferences for all attributes of a property. In addition, the extremely small difference between stated and actual preferences for the experimental group could indicate that people are currently able to meet their preferences for

transit fairly well. If the experimental group members had larger gaps between preferences, this in contrast would indicate that transportation information was allowing them to fulfill latent preferences which were very different from their actual locations.

For distance to nearest destination and all destinations, experimental group participants had a greater location choice gap than control group participants. One possible reason is that participants were unlikely to choose their actual residence based purely on distance destinations, but rather based on ease of accessing the destination. Since information may be affecting different groups in different ways, more detailed analyses were performed on various subgroups within the experimental group.

4.3.3 Experimental Group Effects

Transportation information may affect certain groups of people more than others based on transportation habits and opinions about transportation, as well as demographic characteristics. Analysis was performed to examine what groups of people used information more or less, and how they used it. First I examined group differences based on use, familiarity or previous use of transit, and perceptions of transit. Then I examined group differences based on age, sex, income, children in the household, and affordability of current living situation.

Transportation habits and familiarity with transit had a significant effect on the location choice gap for participants who made more trips by car. The location gap was not different for participants based on percent of University trips by non-motorized modes, AATA, or UM transit. There was no significant difference with regard to non-University trips by AATA and by car. In

addition, previous regular use of transit and perceptions of transit did not have any effect on gaps for the experimental group. Results are shown in Table 9. Data is only shown for variables significant at the 95% level.

Table 9. Significant Interactions with Transportation Variables

Variable	% Non-UM trips by non-motorized mode x Experimental Group		% UM trips by Car x Experimental Group		% Total Trips by Car x Experimental Group	
	Coeff	p-value	Coeff	p-value	Coeff	p-value
Distance to High-Quality Transit			-0.64	0.05**	-0.69	0.04**
Population Density	-41.41	0.03**				

Note: ***, **, and * are significant at 99%, 95%, and 90% levels, respectively

Participants who make more University-related and total trips by car have slightly smaller location choice differences than those who make fewer such trips. Participants making more University trips by non-motorized modes had location differences that were smaller by 41 persons per square mile. Participants making more University trips and total trips by car had smaller gaps of 0.64 miles and 0.69 miles closer to high-quality transit, respectively. This indicates that people using cars for more trips tended to locate closer to transit when given information, showing that their preferences may not be met at present.

There were very limited effects of information between demographic groups. There was no significant effect of age, sex, number of children, or housing affordability on the gap between stated and revealed preferences. However, participants' location choice gaps were significantly different for some variables for experimental group members given their age, income and monthly rent, as shown in Table 10.

Table 10. Significant Interactions with Demographic Variables

Variable	Income X Experimental Group		Rent X Experimental Group	
	Coeff	p-value	Coeff	p-value
Total Buses	-0.12	0.02**	-0.01	0.03**

Note: ***, **, and * are significant at 99%, 95%, and 90% levels, respectively

Participants with higher incomes had differences which were 0.12 buses per hour smaller than those with lower incomes and in the control group. One possible explanation is that people with higher incomes are better able to meet their preferences for transit because cost is not as large of a constraint on their decision-making process. Because cost might not be as large of a consideration in the decision, these participants' current locations more closely reflect their preferences.

Participants paying higher rent exhibited smaller location choice gaps for buses per hour. Participants paying higher rent had gaps which were smaller than those paying lower rent and in the control group by 0.01 buses. Though the variable routes within ¼ mile was also significant, the coefficient was so small as to be negligible. Like the income variable, one possible explanation is that people paying higher rent may be more able to base their decisions on aspects other than cost and thus may live in areas which currently meet their preferences closely. Overall, the effect of information on location choice gaps is quite small despite being significant.

4.3.3 Population Effects

It is important to recognize that gaps between locations chosen may exist regardless of whether participants were in the control or experimental group. To determine what patterns or variations of differences occur in the entire sample, analyses were performed testing significance of group

characteristics for all participants. The same transportation and demographic characteristics that were tested for the experimental group were tested for the entire population.

Transportation habits and familiarity had no effects on location choice gaps for the population as a whole. The difference was not significant for participants based on the percent of University or non-University trips made by non-motorized modes, UM transit, AATA or car. There was also no significant relationship based on perception of transit as inconvenient or not. The location choice gap was not significant for participants based on the age or sex. However, several variables did show significant effects including number of children, household income, and affordability of current housing, as shown in Table 11.

Table 11. Demographic Characteristics within the Entire Population

Variable	Number of Children		Household Income		Affordability	
	Coeff	p-value	Coeff	p-value	Coeff	p-value
Distance to High-Quality Transit	-0.51	0.03**	-0.08	0.03**	-1.16	0.04**
Distance to Nearest Destination	0.89	0.03**				
Sum of Distance to Major Destinations	3.75	0.02**				

Note: ***, **, and * are significant at 99%, 95%, and 90% levels, respectively

Participants with children had very different location choice gaps than the participants as a whole. Participants with children had smaller gaps for network distance to high-quality transit (0.51 miles less). This may reflect the fact that transit is a less viable option for people with children due to many errands and unplanned trips that parents take. In addition, this may reflect the fact that other aspects of properties such as size or schools may cause families to locate in areas that are not as close to their stated transportation preferences. Participants with children may be more satisfied with their current locations with regard to proximity to transit because transit is simply not used as often.

Participants with children, however, had larger differences between locations for distance to nearest destination (0.89 miles more) and sum of distance to major destinations (3.75 miles more). These findings may reflect the fact that families may sacrifice proximity to destinations for other aspects in the residential choice decision. This may be a case where participants with children made their actual decisions with different factors in mind than their simulation decisions. While such participants may desire locations that are closer to destinations, people with children are also more likely to be making residential decisions based on more than one person. For example, if participants have a spouse, the residential location may be more of a compromise than if participants are single-person households.

Participants with higher household income had smaller location choice gaps for network distance to high-quality transit (0.08 miles less). One possible reason is that wealthier participants may be able to better meet their preferences because price is less of a constraint. Wealthier participants might be able to locate in downtown or more populated areas that are better served despite higher housing prices in these areas.

Participants with more affordable housing had smaller location choice gaps for network distance to high-quality transit (1.16 miles less). This may reflect the fact that participants whose housing is more affordable may be more satisfied with their current situations. These participants may be able to consider aspects other than price in their housing choice since their cost is not overwhelming. Since cost is such a major concern of housing, participants whose current housing is affordable may seek out similar properties in the simulation.

5. LIMITATIONS

Several assumptions limit the conclusions found in this study. One of the greatest limits is that there is no way to know how satisfied people were with their current residential location besides assuming the those with low gaps between stated and revealed preferences are more satisfied. However, people may choose properties that are similar to their actual location simply because they are more comfortable with those attributes or because they are justifying their current situation psychologically. Assuming that difference between stated and revealed transportation preferences corresponds with overall satisfaction ignores the fact that people may be completely satisfied in other aspects. People who are satisfied with their residential locations on the whole may also make less use of new information.

The study findings may not be easy to apply to other areas because of the unique transportation system in Ann Arbor. This area has higher levels of transit than are available in many cities, especially those of comparable population size and land area. However, it is possible that results might be even more dramatic in an area where transit is not as readily available. The population of the study may also affect its results because graduate students may not be representative of the overall population. For example, people may not object to living in actual locations which do not correspond with their preferences if the situation is short-term, as is the case with students. There are many unknown aspects of participants and psychology that limit the conclusions.

The findings of this study do not account for some factors that may affect individuals' use of information. The simulated aspects of the residential choice process may not adequately capture actual decision-making processes. Additionally, the results are not definitive. They offer some evidence that relationships exist between how people with different levels of neighborhood type

dissonance use information, but cannot offer conclusions as to how the differences related to demographics within dissonance groups or why such differences exist.

6. CONCLUSIONS AND IMPLICATIONS

The findings of this analysis support previous studies and provide more insight into the possible effects of accessibility and transportation information on residential location processes. The results verify past evidence that many people experience neighborhood type dissonance, a lack of agreement between stated and revealed preferences for accessibility of residential locations. The results also indicate that individuals' revealed preferences are not necessarily consistent, and that people in different situations may express different preferences. Despite this inconsistency, providing information about transportation and accessibility to people who are searching for a residence may provide a way to decrease neighborhood type dissonance for some people. However, the effect is not uniform across all groups, therefore information may not help reduce neighborhood type dissonance or narrow the preference gap for some types of people.

Seventy-one percent of participants experienced neighborhood type dissonance between their stated preference for accessibility and the accessibility of locations they chose in the simulation. Forty-two percent of participants experienced neighborhood type dissonance between their stated preference for accessibility and the accessibility of their actual residential location. This shows that people choose different types of locations in reality than they choose in a simulation. People reveal differing preferences for accessibility when choosing housing in a simulated setting and in reality. This suggests that people may have inconsistent preferences when multiple types of decisions are considered. This type of explanation is supported previous research that suggests

the limitations of using revealed preference data from experiments as a true reflection of people's preferences. Though certain unique circumstances such as the temporary nature of student residential tenure may contribute to this finding, it is important to use caution when making conclusions based on revealed preferences from a survey. Despite inconsistencies, the findings suggest that there are many individuals who experience dissonance between their residential locations and their preferences, and information may be able to affect this dissonance.

The effect of information may depend on the way that revealed preferences are measured. Individuals with neighborhood type dissonance between their stated preference and their simulated preferences were more likely locate in statistically different areas when given information. Participants with low dissonance between their stated and simulated preferences chose locations in areas that were less dense when they received information. Their counterparts experiencing low dissonance between stated preferences and actual location preferences did not locate in statistically different areas. Individuals with medium dissonance between stated and simulation properties chose locations that were closer to high-quality transit, their nearest destination, and all destinations as a whole, while their counterparts chose locations that were closer to transit and the nearest destinations, but by smaller distances. The results were also less significant for people with dissonance between stated and actual preferences. The differences between the two measures of neighborhood type dissonance were greatest for individuals with high dissonance. Individuals with high dissonance between stated and simulation preferences located closer to high-quality transit and in areas that were more dens, while individuals with dissonance between stated and actual preferences located closer to all destinations. These findings indicate that results can vary depending on the type of revealed preference data used.

Since simulation preferences represent a hypothetical situation, actual locations may be a better reflection of individuals' preferences in general. However, the unique aspects of the participants as graduate students may contradict this since students may choose to live in areas that do not reflect their preferences knowing that they will remain there only for a limited number of years.

The effect of providing information to individuals in the residential search process may depend on the levels of dissonance individuals are experiencing. Individuals with low dissonance who received information chose locations that were not statistically different than those who did not receive information, except that they located in less dense areas. This may be because people whose preferences are consonant are unlikely to want to change their location. People with low dissonance could be less pervious to information for a variety of reasons. People may experience low dissonance because they chose locations based on accessibility even without the information or alternatively because they do not consider accessibility to be an important factor in their decision. Individuals with medium dissonance that were given information chose locations that were more accessible in terms of access to transit and distance to destinations. This may be because providing information allows these individuals to find locations that more closely match their preferences. These individuals may be people who are unlikely to seek out that information but will use it if provided. Individuals with high dissonance that were given information chose locations that were more accessible according to some measures, but the differences were not as significant as for individuals with medium dissonance. This may be because high dissonance may be caused by factors that are not affected by information. For example, individuals may be locating in areas that do not align with their preferences because they need to be near family members, have a spouse that works in another area, or have other constraining factors. Whatever

the reasons for varying levels of dissonance, the findings indicate that information does not affect people with different levels of dissonance in the same way.

The effect of information also varies according to how accessibility is measured. The difference between locations was more significant in general for distance to high-quality transit than for distance to destinations. The effect of information on distance to high-quality transit and distance to nearest destination was significant for individuals with medium dissonance for both types of revealed preferences. In both cases, the effect of information on distance to high-quality transit was more significant than the effect of information on distance to nearest destination. This may mean that providing information can have a greater affect on individuals' location choices relative to transit services than relative to their destinations. This could indicate that people may be more willing to change their location to be close to transit than to change their location to be close to their destination. The way people evaluated accessibility may depend on the ability to get to a destination rather than simple proximity.

Information can affect the difference between locations chosen by individuals in reality and in simulations, but these effects are not uniform either. Information tended to relate to smaller gaps between choices for network distance to high-quality transit but, greater gaps for distance to destinations. This may be because more information can allow people to find locations which better meet their preferences. At the same time, more information may also allow people to consider additional factors in their decisions that they didn't consider previously, causing greater differences between the residential locations they choose.

Certain groups of people use transportation information in different ways. There were very small differences in locations chosen between groups with relation to whether or not individuals received information, even when that difference was significant. In may be the case that some types of people may be more prone to having larger gaps in preferences to begin with, such as individuals with children. Reducing neighborhood type dissonance for these individuals may be more difficult no matter the methods attempted given the variation in considerations and the different weight which such people place on aspects of residential location.

The effects of information on residential choices may depend on individuals' level of neighborhood type dissonance, or the similarity between the accessibility of their desired and actual residential locations. Individuals with different levels of dissonance, travel habits, and demographic characteristics may respond differently to information. The variation in how different people respond to information indicates that providing more transportation information to housing-seekers may not necessarily lower the dissonance that people experience. Providing more information may bring factors to the forefront that people did not previously consider, and for people with medium neighborhood type dissonance, this information can significantly change their behavior. Given the many variables which go into the housing decision, providing more transportation information to consider may mean that preferences for other factors become less pertinent and gaps for these aspects increase. Therefore, a one-size-fits-all approach to providing transportation information is not a reliable way to reduce individuals' location dissonance.

Even if providing information does not affect all people, this does not mean that information efforts should be discounted. Information designed to promote living in highly accessible areas

and riding transit should be tailored if possible to the type of person that is looking for housing. Determining neighborhood type dissonance levels does not require extensive statistical analysis, and can be done by asking qualitative questions about how satisfied people are with their transportation options. Using a quick determination of a person's level of dissonance, real estate agencies or housing search processes could provide information to those people who exhibit some level of dissonance. For people who express extreme preferences for aspects other than accessibility, information could be limited. This type of tailored information can allow real estate agents to maximize the effect of information and prevent this type of information from being offered and overwhelming people who are unlikely to use it.

Since housing decisions reflect a maximum total utility, providing information to all individuals may help people meet their transportation preferences at the expense of other preferences. It is assumed that people who have lower neighborhood type dissonance are more satisfied with their current situations, but these analyses looked accessibility-related preferences as opposed to the other preferences that have large effects on housing choice. While information may appear to reduce individuals' dissonance for accessibility, if it increases the gap for another variable the overall effect may be neutral or negative. Advocates must use caution in urging provision of information to all people as a way to reduce the gap between stated and revealed preferences because providing information has variable effects on different types of people. However, identifying and providing tailored information to certain housing seekers may be a way to reduce neighborhood type dissonance and allow people to make more educated decisions about residential locations.

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